Faculty of Science, Department of Computer Science

CPS 420: Discrete Structures – W2025

Instructor Information

- **Instructors' Names:** Claude Gravel (Sections 1-5) and Sophie Quigley (sections 6-10)
- **Course Coordinator:** Sophie Quigley
- **Office Locations:** Gravel: ENG241, Quigley : ENG263
- **Office Hours:** Posted on D2L calendar. All students can attend all office hours.
- **Course Websites:** D2L and https://www.cs.torontomu.ca/~cps420/
- **Email Address:** cps420@cs.torontomu.ca

Email Policy

Torontomu's email policy states that only Torontomu e-mail accounts are to be used for communication with students. All students, including continuing education students, have access to Torontomu email through the my.torontomu.ca website, and this is the official way in which they receive communication. All students are required to register for and maintain this account. Emails sent from other accounts may not be answered.

Please send all course-related emails to cps420@cs.torontomu.ca. Emails sent from a student's TMU email address to the official course email address and which only require a simple response will normally be answered within one business day. Replies to emails requiring more complex responses will take longer.

Email cannot be used to request the regrading of assessments in this course. Instead please use this Google form: https://forms.gle/BcnMrL3xFaAVUg7r9

Course Description

Introduction to discrete structures as they apply to design and analysis. Review of proof techniques. Induction and recursion. Graphs and trees, and their applications in computing. Finite automata and regular expressions. Counting: arithmetic and geometric progressions, permutations and combinations, modular arithmetic.

Weekly Contact: Lecture:3 hrs, Lab:1hr

Prerequisites: MTH110, CPS305
Anti-requisites: MTH210

Course Details

Course Learning Outcomes

At the end of the course, a successful student will be able to:

1. Have a good understanding of the theoretical materials listed in the course content below.
2. Apply this knowledge to solve problems in computer science.

Course Textbook

Discrete Mathematics with Applications, 5th Ed. by Susanna S. Epp, Nelson ISBN-13: 978-1-337-69419-3, ISBN-10: 1-337-69419-3. This textbook is optional, and second-hand copies may be used. An electronic version is available for $74.95 from the publisher at the above link.

Course Schedule: Topics

The content of this course is split into four modules. The table below presents a tentative schedule of the course for all sections. A detailed schedule will be updated throughout the semester.

Dates	Module	Topics
Weeks 1-4: Jan 13 – Feb 7	**Induction and Recursion**	• Sequences, Recursion • Review of proof methods • Proofs by induction
Weeks 5-7: Feb 10 – Mar 4	**Graph Theory**	• Directed and undirected graphs • Paths and circuits • Matrix representation of graphs • Trees
Weeks 7-10: Mar 3 – Mar 25	**Automata**	• Formal languages • Regular expressions • Deterministic Automata • Non-Deterministic Automata
Weeks 10-12: Mar 24 – Apr 11	**Counting and Probabilities**	• Counting • Combinatorics • Probabilities

Teaching Methods

The lectures, labs, and exams in this course will be in person on campus, and they will not be recorded. The slides used for the lectures will be posted in D2L. Please check the D2L calendar

for the schedule and mode of the office hours.

Instructional Technology:

All the technology required for this course, except for digitization of hand-written work, is available in the Computer Labs of the Department of Computer Science.   In addition to D2L and G Suite, here are the technologies that will be used in this course:

- **Top Hat** to add interactivity to the lectures. Participation in Top Hat is optional but encouraged. It is free. You will probably want to run Top Hat on your smaller device. The join code is 701003 for lectures with Dr. Gravel and 390813 for lectures with prof. Quigley.

- **Crowdmark** to submit most of the labs. Work should be scanned or photographed and submitted in pdf or image format in the associated Crowdmark assessment.

- **JFlap** version 7.1, which is an interactive system to create automata. Please download and install it on your system. You will need to install the **Java runtime environment** on your system to run the JFlap system, which is a jar file.

- **A Google Shared Drive** will also be used to store a copy of the lecture slides posted in the D2L content section, as well as the versions annotated by hand during the lectures and other materials. All G-Suite facilities used in the course including this drive are only accessible via torontomu.ca accounts. Access will not be granted to non-torontomu accounts.

- For the assignment, you will also be asked to code in Java on the Department of Computer Science servers.   To access the servers remotely you will need SSH and SFTP clients.

Students may use Generative AI (e.g. ChatGPT, Grammarly, Perplexity, DeepL Translator) only for grammar correction or as a study tool for tests and exams, but not for other assessments in the course. Failure to stay within these limits will be considered a breach of Policy 60. In particular the use of Generative A.I. for code generation is completely prohibited.

Evaluation

Evaluation Component	Handed out	Due	Team Size	Weight
10 Labs	See Detailed schedule		Varies	40%
Assignment: graph theory	Feb 26	Mar 23	1 or 2	5%
Midterm: first two modules	March 14, 7-9PM	Immediately	1	25%
Final exam: last two modules	TBA: exam period	Immediately	1	30%
Total:				100%

Additional Details

1. Students cannot pass the course unless they have passed the exam component of the course: midterm and final worth 55%

2. Grades for the midterm and the first five labs (altogether worth 44%) will be returned to students before the last drop date of Thursday March 27, 2025.

3. Labs and the assignment are due at 11:59PM. Except for labs 5, 9 and 10, they can all be handed in late with a penalty. The days counted are weekdays, i.e., Monday to Friday. For example, work due on a Friday and handed on the next Monday is only one day late. However, even though Saturdays and Sundays are excluded from the day count, holidays and reading week are not. The late penalty is the following percentage of the **maximum grade for the evaluation**:

1 day late	2 days late	3 days late	4 days late	5 or more days late
-5%	-10%	-25%	-50%	-100%

4. Lab 5 is a partial preparation for the midterm. Solutions will be posted the day after the due date and therefore it will not be possible to hand it in late. Labs 9 and 10 are preparations for the final exam. They are both due late in the term but before the final exam. Late submissions will not be accepted because solutions will be posted before the final exam. However, lab 10 is optional: its grade will be the maximum of the grade on the submitted lab10, and the grade of the counting and probabilities component of the final exam.

Intellectual Property

Sophie Quigley and/or Claude Gravel hold the copyrights in the works of all original materials used in this course and students registered in this course can use the materials for the purposes of this course but no other use is permitted, and there can be no sale or transfer or use of the work for any other purpose without explicit permission of Sophie Quigley or Claude Gravel. In particular none of the material can be posted in code repositories or any other website, public or otherwise.

Toronto Metropolitan Unviersity provides further information on Copyright for students.

University Policies

Students are required to adhere to all relevant university policies found in their online course shell in D2L and/or on the Senate website, and in particular Academic Integrity Policy 60.

Please review the CPS420 page on Team Work and Academic Integrity for additional information on academic integrity for this course.

Important Resources Available at Toronto Metropolitan University

- [The Library](#) provides research [workshops](#) and individual assistance. If the University is open, there is a Research Help desk on the second floor of the library, or students can use the [Library's virtual research help service](#) to speak with a librarian.

- [Student Life and Learning Support](#) offers group-based and individual help with writing, math, study skills, and transition support, as well as [resources and checklists to support students as online learners.](#)

- You can submit an [Academic Consideration Request](#) when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement. You may always visit the [Senate website](#) and select the blue radio button on the top right hand side entitled: Academic Consideration Request (ACR) to submit this request.

  In the event that the missed evaluation is the final exam, students are required, in addition to the form previously mentioned, to petition for an INC grade with the Incomplete Grade Request Form. To be allowed to write the makeup exam, you will need that form and a verified Academic Consideration Request.

  For Extenuating Circumstances, Policy 167: Academic Consideration allows for a once per semester ACR request without supporting documentation if the absence is less than 3 days in duration and is not for a final exam/final assessment. Absences more than 3 days in duration and those that involve a final exam/final assessment, require documentation. Students must notify their instructor once a request for academic consideration is submitted. See Senate [Policy 167: Academic Consideration.](#)

- Information on Copyright for [Faculty](#) and [students.](#)

Accessibility

- Please contact any of the course instructors using any of the methods described on the front page if you discover an accessibility barrier with any course material or technology

Academic Accommodation Support

Academic Accommodation Support (AAS) is the university's disability services office. AAS works directly with incoming and returning students looking for help with their academic accommodations. AAS works with any student who requires academic accommodation regardless of program or course load.

- Learn more about [Academic Accommodation Support.](#)

- Learn [how to register with AAS.](#)

Academic Accommodations (for students with disabilities) and Academic Consideration (for students faced with extenuating circumstances that can include short-term health issues) are governed by two different university policies. Learn more about [Academic Accommodations versus Academic Consideration](#) and how to access each.

Wellbeing Support

At Toronto Metropolitan University, we recognize that things can come up throughout the term that may interfere with a student's ability to succeed in their coursework. These circumstances are outside of one's control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis.

If you are experiencing a mental health crisis, please call 911 and go to the nearest hospital emergency room. You can also access these outside resources at anytime:

- **Distress Line:** 24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416–408–4357)

- **Good2Talk:** 24/7-hour line for postsecondary students (phone: 1-866-925-5454)

- **Keep.meSAFE:** 24/7 access to confidential support through counsellors via [My SSP app](#) or 1-844-451-9700

If non-crisis support is needed, you can access these campus resources:

- **Centre for Student Development and Counselling:** 416-979-5195 or email csdc@torontomu.ca

- **Consent Comes First – Office of Sexual Violence Support and Education:** 416-919-5000 ext 3596 or email osvse@torontomu.ca

- **Medical Centre:** call (416) 979-5070 to book an appointment

We encourage all Toronto Metropolitan University community members to access available resources to ensure support is reachable. You can find more resources available through the [Toronto Metropolitan University Mental Health and Wellbeing](#) website.